



What Factors Could Impact This Winter's Weather?

Winter 2014 – 15 Outlook




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Overview

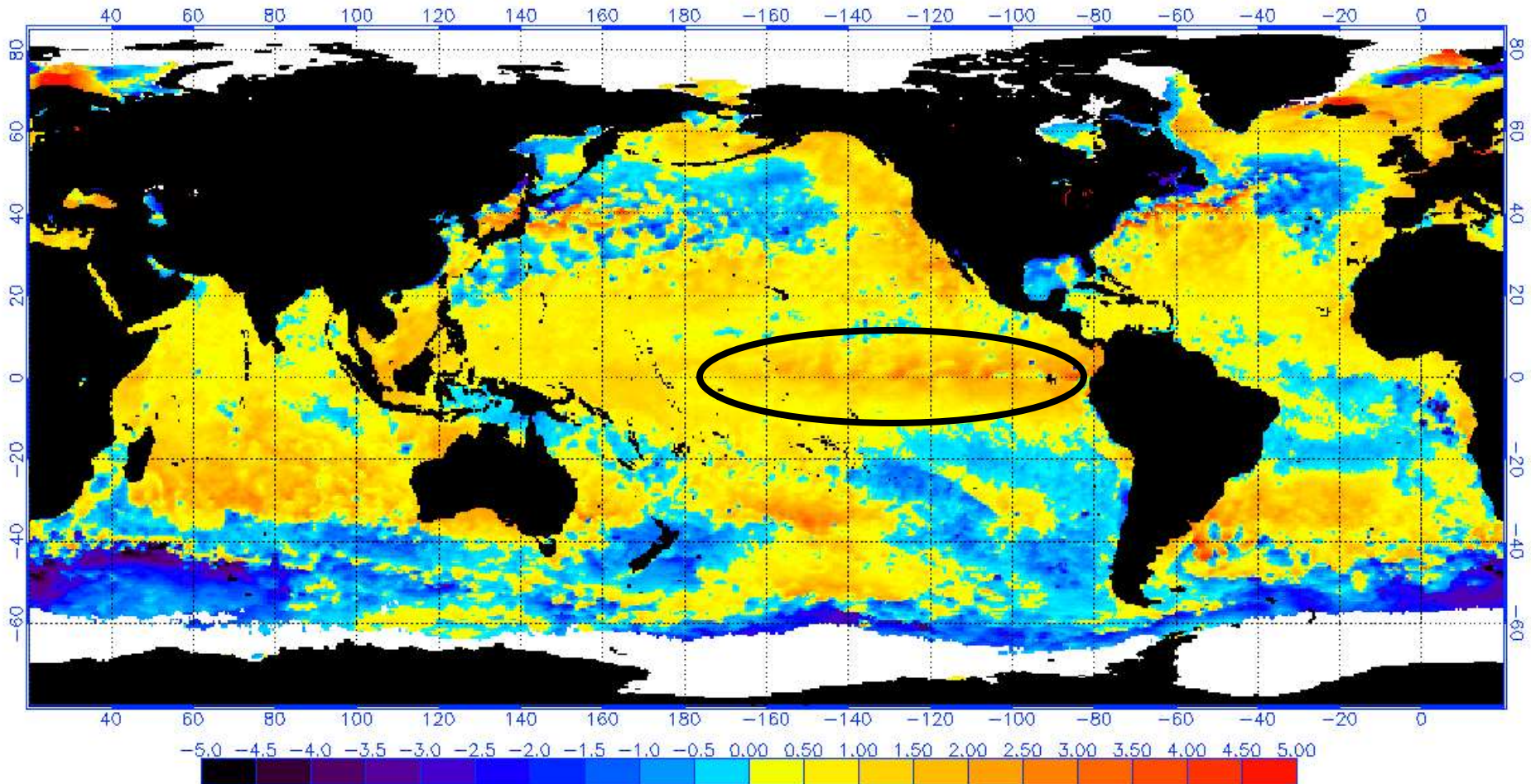
- El Niño in the tropical Pacific
 - Weak versus strong El Niño episodes
 - Other factors to consider
 - Arctic Oscillation and North Atlantic Oscillation
 - Snow cover advance and extent in Eurasia in October
 - Pacific Decadal Oscillation/ Ocean temperature anomalies in the Gulf of Alaska
 - Winters following cold Novembers
 - CPC Updated Winter Outlook
 - Summary
 - Conclusion
 - Short Term Outlook
- 
- The slide features several white snowflake graphics of varying sizes and orientations, scattered across the right side and bottom of the blue background.

El Niño in the Tropical Pacific Through the Winter

El Niño: warmer than average ocean temps in tropical Pacific



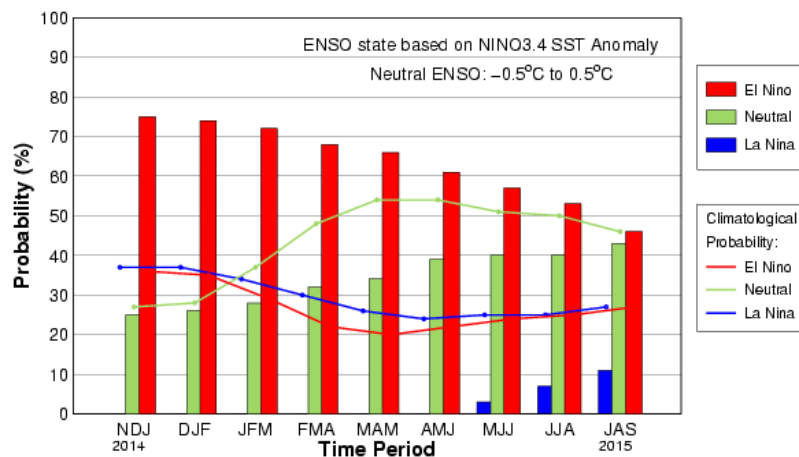
NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 11/24/2014
(white regions indicate sea-ice)



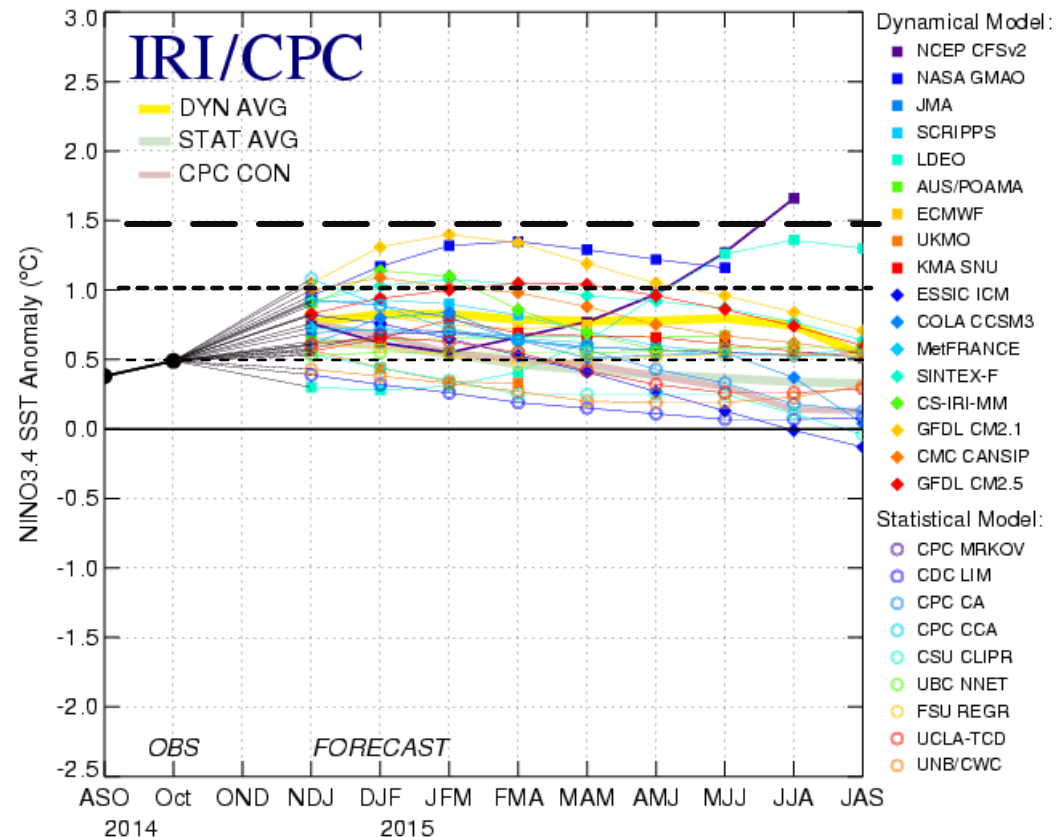
El Niño in the Tropical Pacific Through the Winter

Consensus is Still for *Weak Episode* in Dec-Feb

Mid-Nov IRI/CPC Plume-Based Probabilistic ENSO Forecast



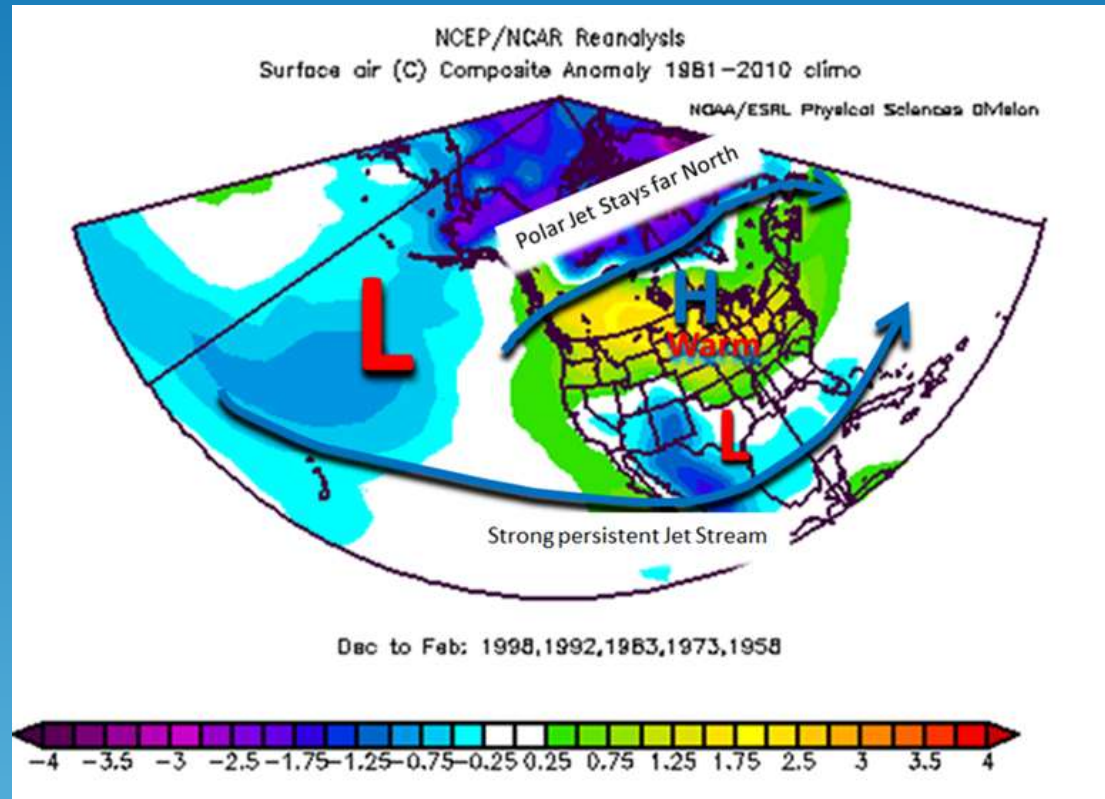
Mid-Nov 2014 Plume of Model ENSO Predictions



0.5 to 1.0: Weak
1.0 to 1.5: Moderate
1.5 + : Strong

Strong El Niño Composite

Upper Pattern and Temperature Anomalies

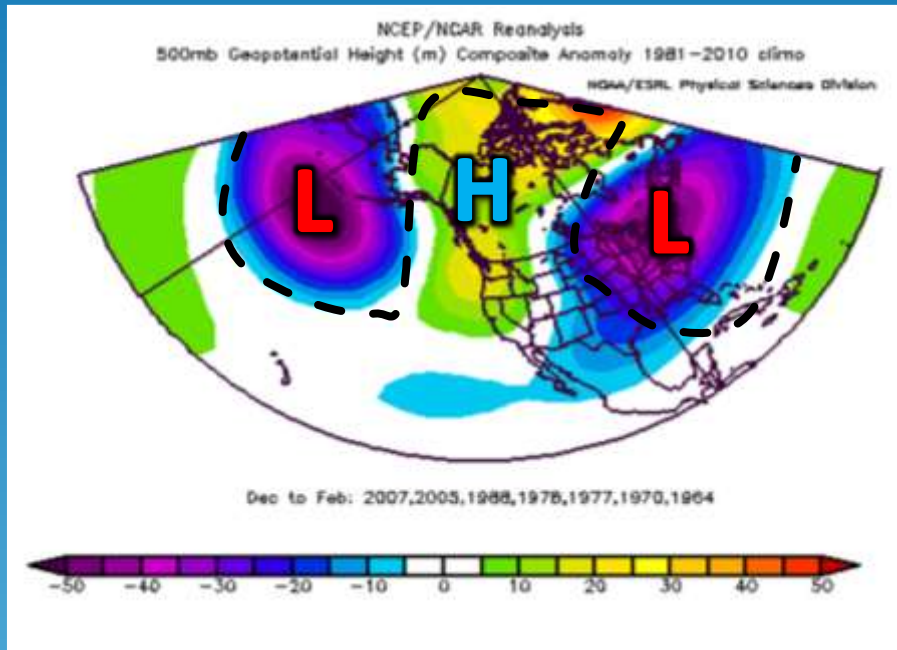


- Well above normal temps and less snowy winters.
- Good example 1997–98 winter season.

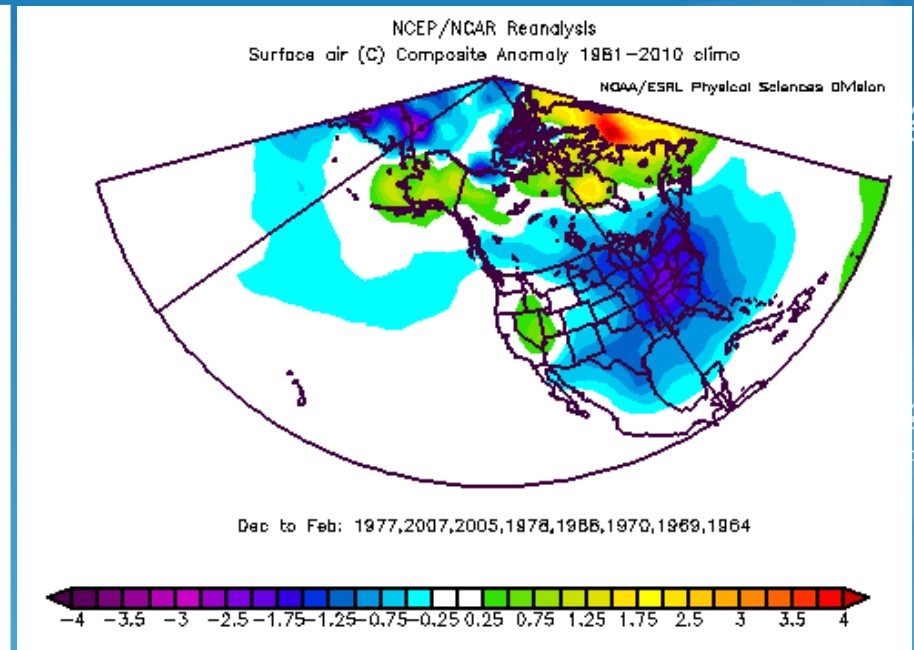
Weak El Niño Composite



Upper Pattern



Temperature Anomalies



- The upper level jet stream tends to become buckled southward over the eastern half of the country.
 - Favors colder than average conditions across much of the eastern CONUS.

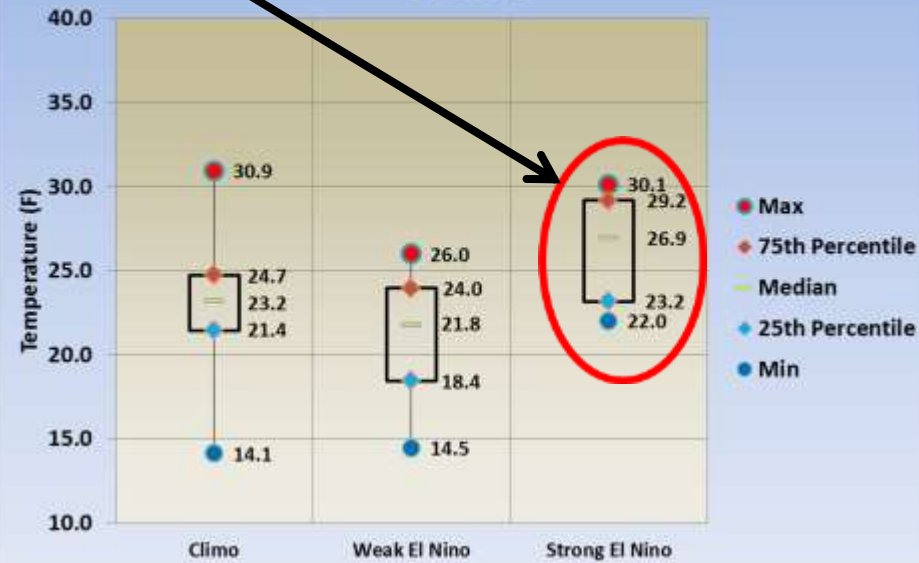


Much Warmer during Strong (Colder during weak) El Niño Winters

Chicago Average Winter Temperature By El Nino



Rockford Average Winter Temperature By El Nino



Info Based off 8 weak events and 6 strong events.

- 75th percentile near the Climo Median during weak events.
- 25th percentile near or just above the Climo Median during strong events.

Chicago, IL

All Years

Strong

Weak

Temperatures

Average

El Niño

El Niño

December

28.1°F

+2.5°F

-1.3°F

January

23.2°F

+3.6°F

-2.3°F

February

27.4°F

+2.5°F

-2.1°F

Winter Season

26.2°F

+2.9°F

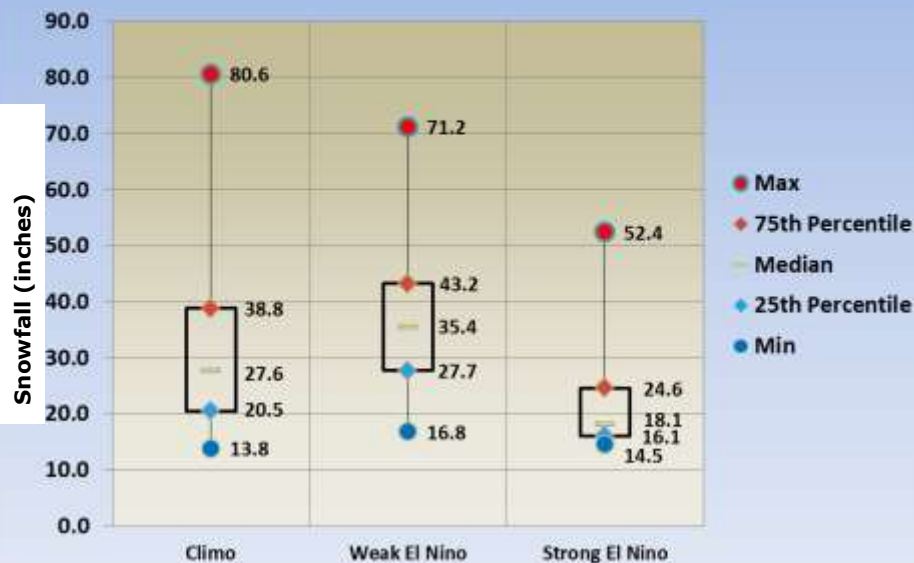
-1.9°F

Note: The figures above display the percentiles of each distribution. So, for example, the 25 percentile (shown as a blue diamond) means that 25% (75%) of the years were colder (warmer) than the indicated value.

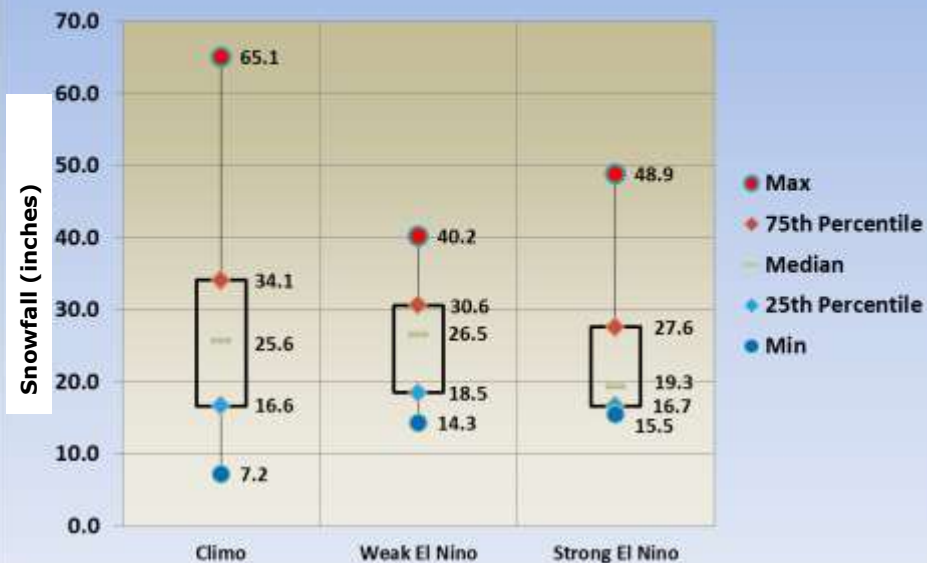
Weak Versus Strong El Niño Snowfall



Chicago Winter Snow By El Nino



Rockford Winter Snow By El Nino



- Weak El Niño events tend to produce more snow locally than their stronger counterparts.
- The colder conditions associated with these weak El Niño events can also set up more favorable conditions for lake effect snow, thus favoring near or even above average snowfall for areas near Lake Michigan. However, overall there is no significant tendency for snowier than normal winter seasons during weak ENSO events, especially away from Lake Michigan.

Note: The figures above display the percentiles of each distribution. So, for example, the 25 percentile (shown as a blue diamond) means that 25% (75%) of the years had less snow (more snow) than the indicated value.

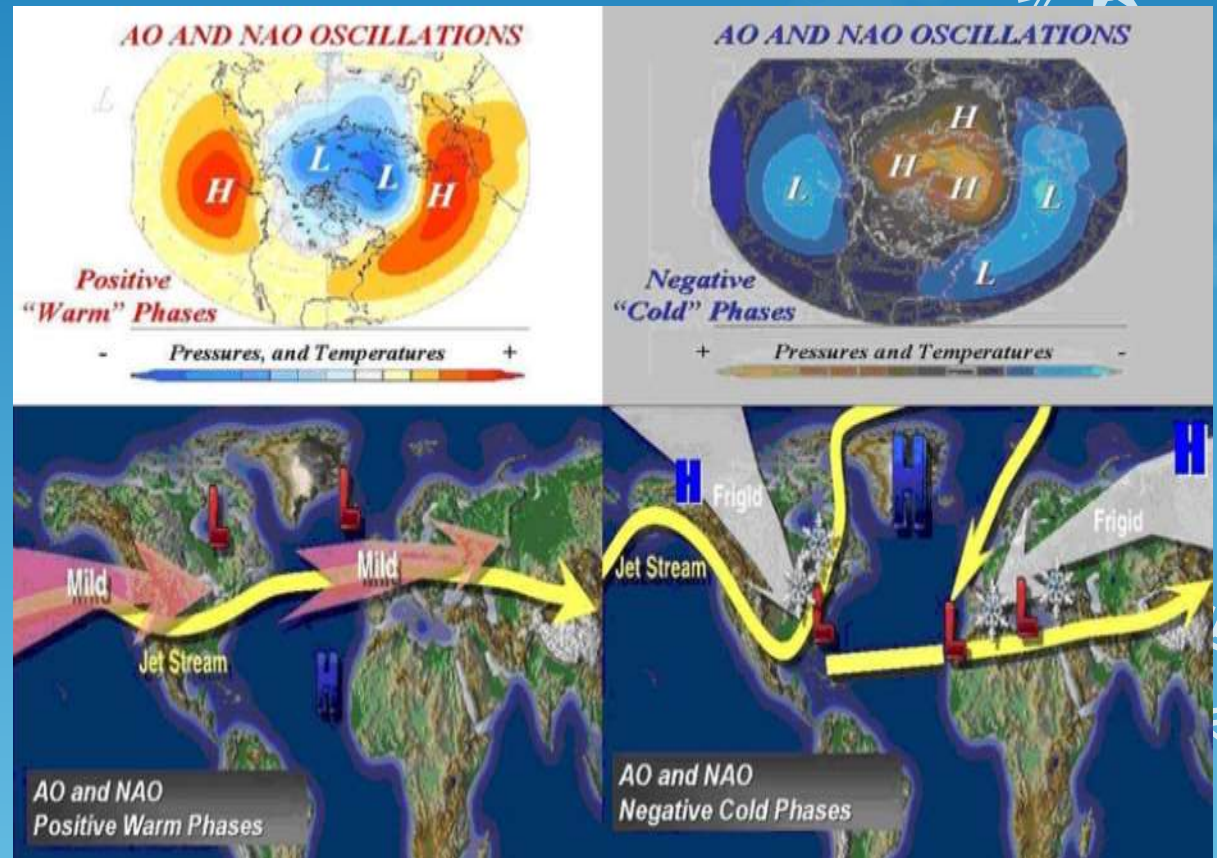
Other factors to consider



The Arctic and North Atlantic Oscillations (AO/NAO)

- Consists of the positive and the negative phases shown in the image below.

- Negative phase favors more arctic outbreaks with colder than normal conditions and more snowfall across the eastern half of the country.
- Positive phase favors warmer and drier conditions across the eastern half of the country.



The Arctic and North Atlantic Oscillations (AO/NAO)

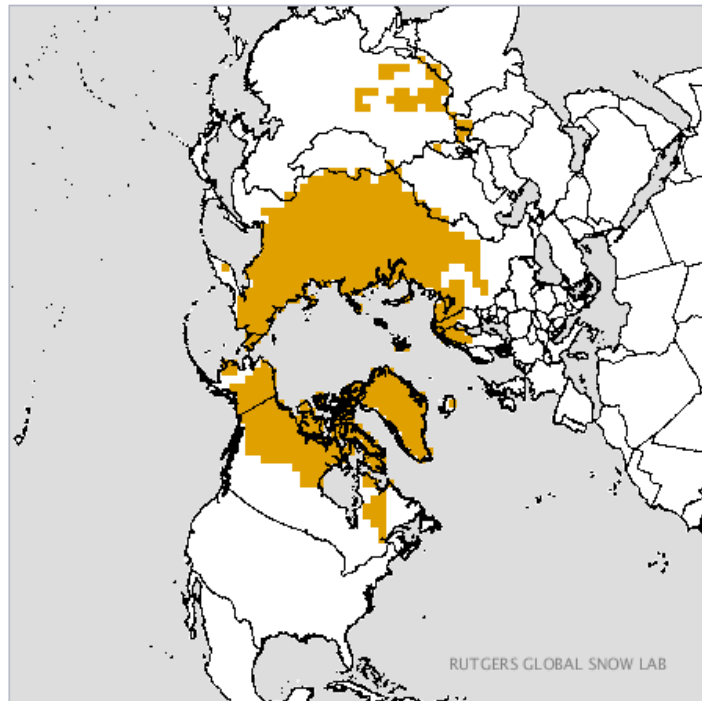
○ Could prove to be the difference between a mild or colder winter.

→ *Somewhat unpredictable beyond a few weeks, though new research within the past few years is promising in terms of predictability of the predominant seasonal scale AO/NAO pattern.*

Rapid October buildup of Snow cover across Eurasia

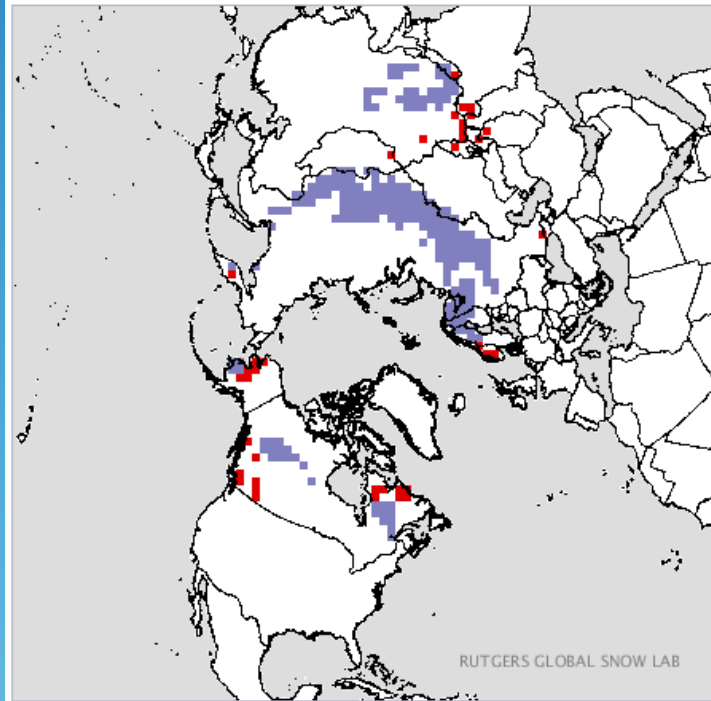
- Some research suggests that there is a strong correlation between rapid snow advancement and overall extent across Siberia and Eurasia during October and winter temperatures over the Eastern CONUS.
- The research suggests this can favor a predominantly $-AO$ during the following winter season.
- October snow built up very rapidly across Siberia, which could drive a $-AO$ this winter. *Snow cover advance and snow cover extent across Eurasia in October 2014 was the 2nd highest in the satellite era after 1976-77.*

Daily Snow - October 19, 2014 (Day 292)



Legend: ■ Snow Covered □ Snow Free

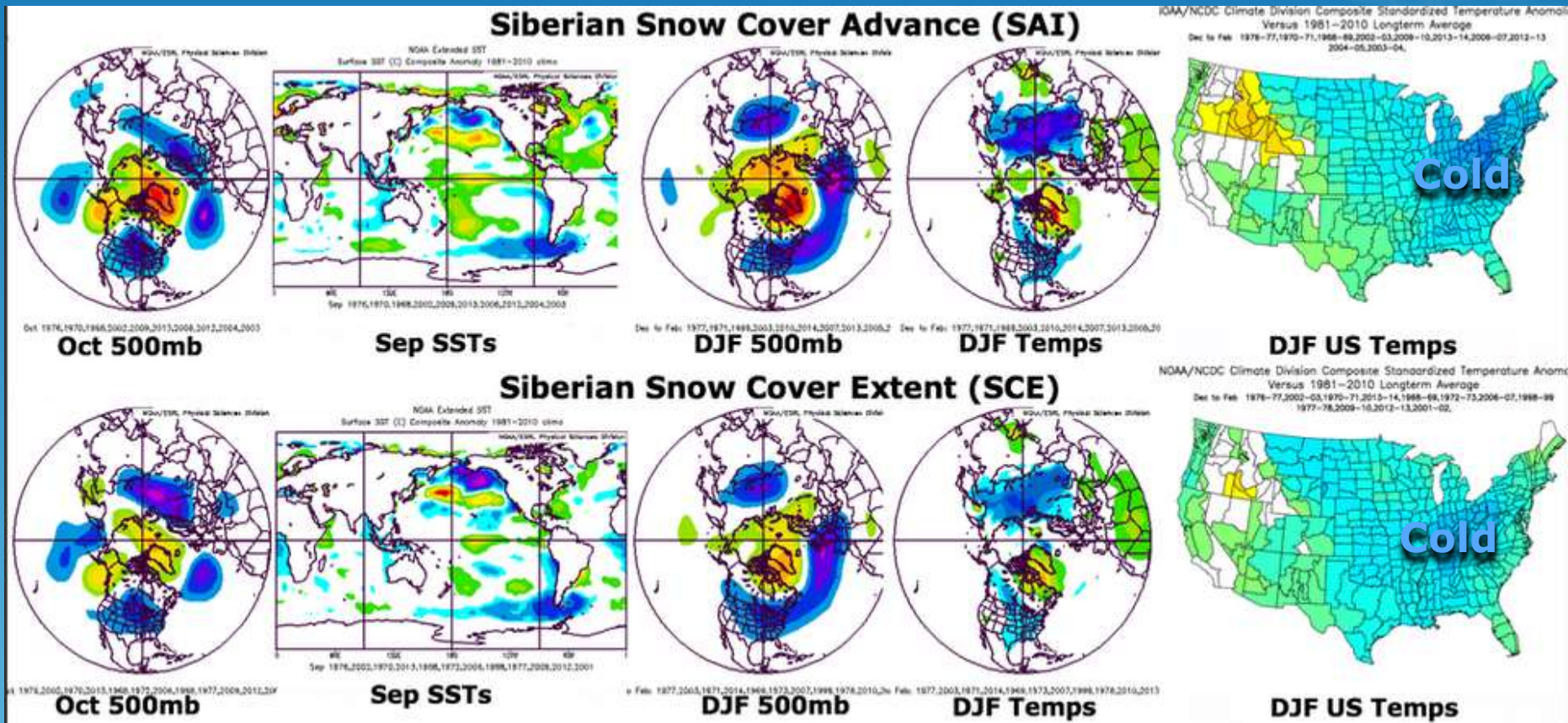
Daily Departure - October 19, 2014 (Day 292)



Legend: ■ Positive ■ Negative □ No Anomaly

Winters With High Eurasian Snow Cover

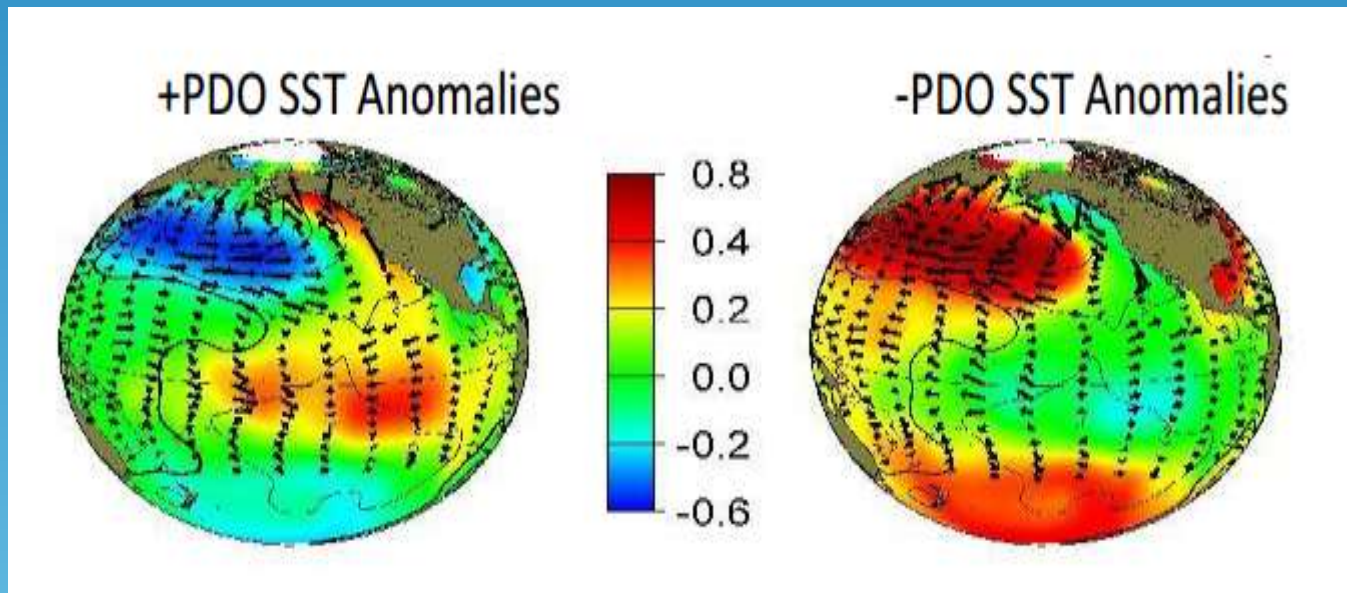
Advance and Extent



- Higher upper level atmospheric pressure over the polar region during the –AO/NAO displaces the upper level jet stream farther south over the country.
 - Favors colder than average conditions, especially across much of the eastern half of the CONUS.

Pacific Decadal Oscillation

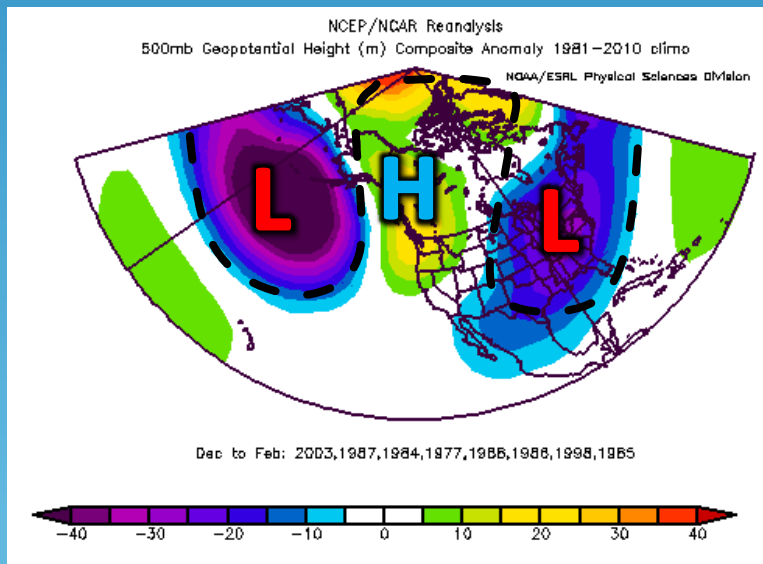
- PDO is the Pacific Decadal Oscillation
 - A pattern of SST anomalies in the central and northern Pacific
 - Has a positive (warm) and negative (cool) phase
 - Tends to have an impact on the upper level pattern across North America in the winter
 - Usually has a pattern of predominant phases that lasts 20-30 years but does have year to year variability



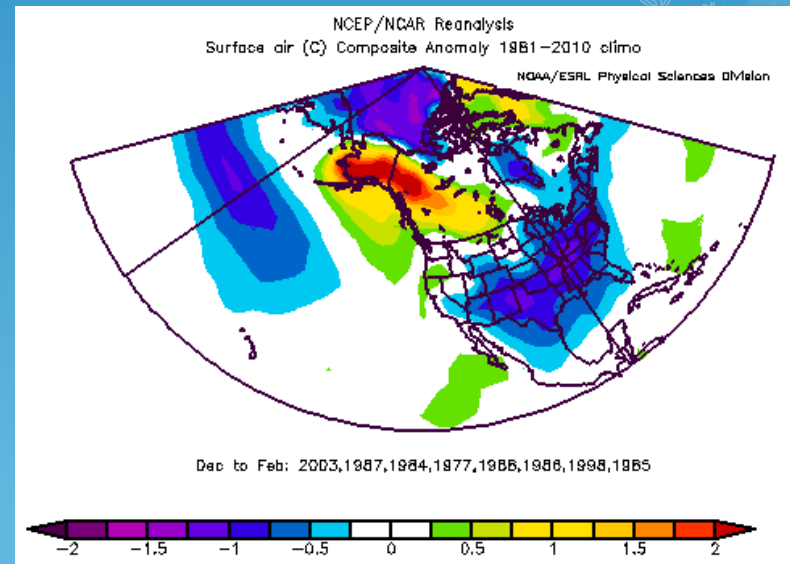
Pacific Decadal Oscillation

- The PDO has been predominantly negative since the late 1990s
 - However, it has shifted to positive in 2014
 - October value was +1.28
- Since the 1970s, 8 winters have had an average PDO value of +1 or greater.
 - 1976-77, 1983-84, 1984-85, 1985-86, 1986-87, 1997-98, 2002-03
- The +PDO also tends to support a buckled jet stream and colder winter season conditions across the eastern and portions of the southern CONUS.

Upper Level Pattern
PDO $\geq +1$ in Dec - Feb



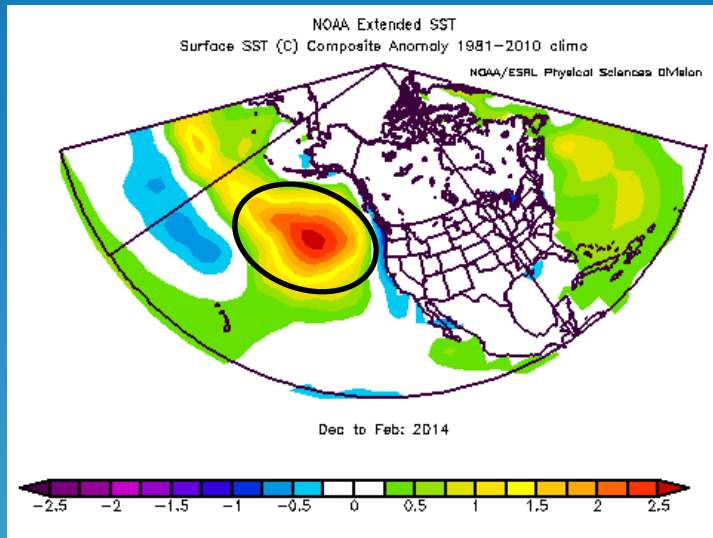
Temperature Anomalies
PDO $\geq +1$ in Dec - Feb



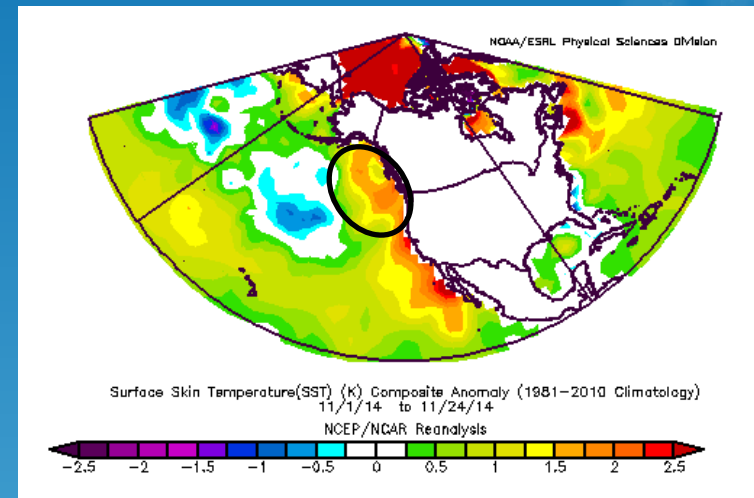
Well Above Normal Water Temps in northeast Pacific/Gulf of Alaska (+PDO)



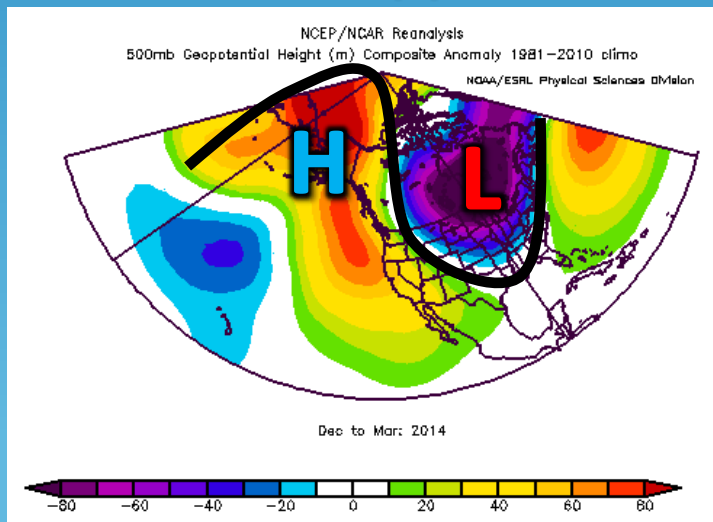
Winter 2013-14



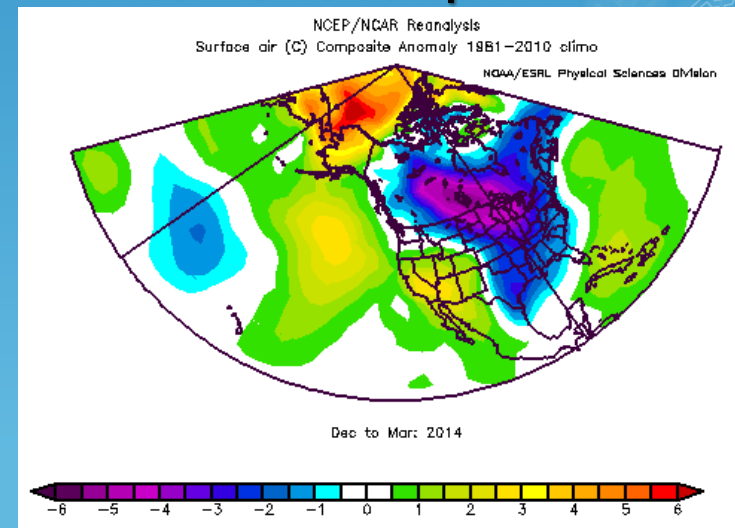
November 2014



Winter '13-14 Upper Pattern



Winter '13-14 Temp. Anomalies



It's Been a Very Cold November



Winter Departures From Normal					
Following Coldest Novembers on Record					
Year	Nov	Dec	Jan	Feb	Winter
1872	-8.7	-10.5	-4.5	-3.3	-6.1
1880	-8.7	-4.9	-4.7	-1.9	-3.8
1976	-7.5	-8.9	-14	-0.1	-7.7
1995	-7.5	-2.6	-0.8	-1	-1.5
1951	-7.4	-2.7	3.1	5.2	1.9
1959	-6.9	6.9	4	-1.3	3.2
1996	-6.9	-1.2	-4.8	2	-1.3
1891	-6.5	6.5	-4.6	3.2	1.7
1873	-6.1	3.1	4	3.5	3.5
1950	-6	-9.3	-0.6	0.2	-3.2
1894	-5.9	3.5	-6.6	-10	-4.4
1911	-5.8	6.1	-12.2	-5.3	-3.8
1947	-5.7	1.1	-6.1	-0.7	-1.9
1892	-5.6	-5.4	-12.1	-5.6	-7.7
1991	-5.1	1.3	4	6.3	3.9

For Chicago: 1871-Present

10 of 15 were colder than average in the winter season: **67%**

Only 3 of the 15 were more than 3 degrees above average.

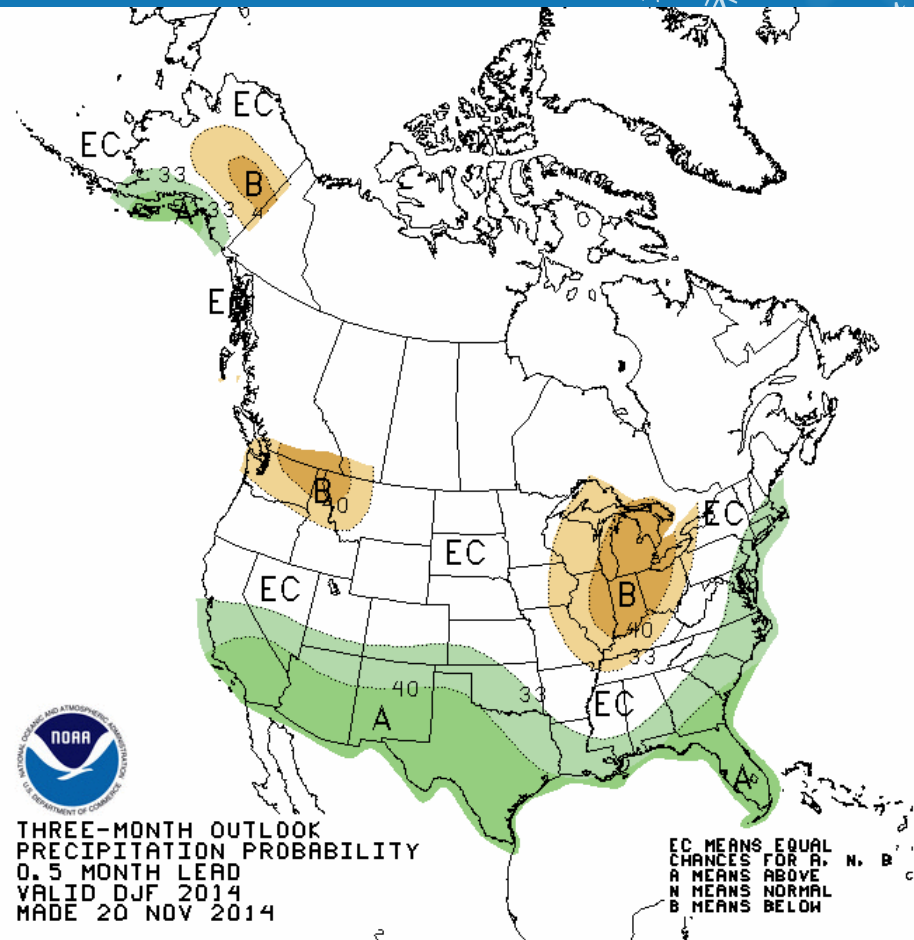
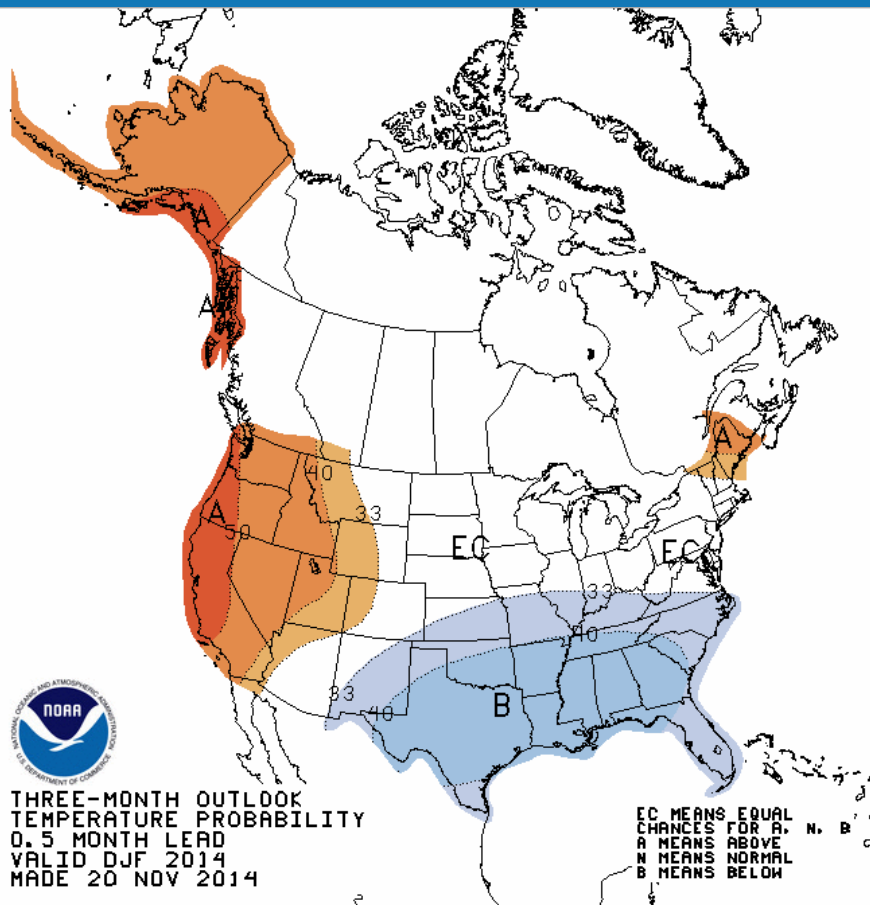
December had more variability following cold Novembers (8 of 15 colder than average) but only 4 were significantly warmer than average (+3 or higher)

11 of 15 Januarys colder than average & 10 of 15 Februarys colder than average

Only 2 (1873-74 and 1991-92) had 3 consecutive warmer than avg months.



Updated CPC Winter Outlook



- Equal Chances for Above or Below Normal Temps
- Enhanced Chances for Below Normal Precipitation



Summary

Based on what we know now:

- El Niño very likely, but consensus is still for a weak episode.
- Weak events can result in colder winters over the eastern CONUS, with average to slightly above average snowfall locally.
- Strong El Niño events tend to produce warm and much below normal snowfall winters.

Things to watch/keep in mind:

- Arctic Oscillation (AO) and North Atlantic Oscillation (NAO).
 - > Snowfall built up very rapidly across Eurasia in October (research has shown a correlation for cold eastern CONUS winters –AO). This could mean a –AO/NAO this winter, also supporting cold in the east.
- The pool of warm SST's throughout the North Pacific (+PDO).
 - > Currently in positive phase. Moderately to strongly positive PDO winters have shown a tendency for colder conditions in the eastern half of the U.S. due to the tendency for more Northeast Pacific/western North America ridging and hence an increasingly buckled jet stream pattern over eastern North America.
- It's been a very cold November. 10 of the top 15 coldest Novembers in Chicago went on to be colder than average during December – February.

Conclusion

NWS Chicago Outlook for Winter 2014-15 ***Northern/Central IL and Northwest Indiana***

Overall, there are several signs pointing to an increased potential for a colder than average winter. However, this does not mean it will be cold all winter, nor does this mean it will be as cold and snowy as last winter. It simply means that the average 3 month winter season could end up on the colder side of average.

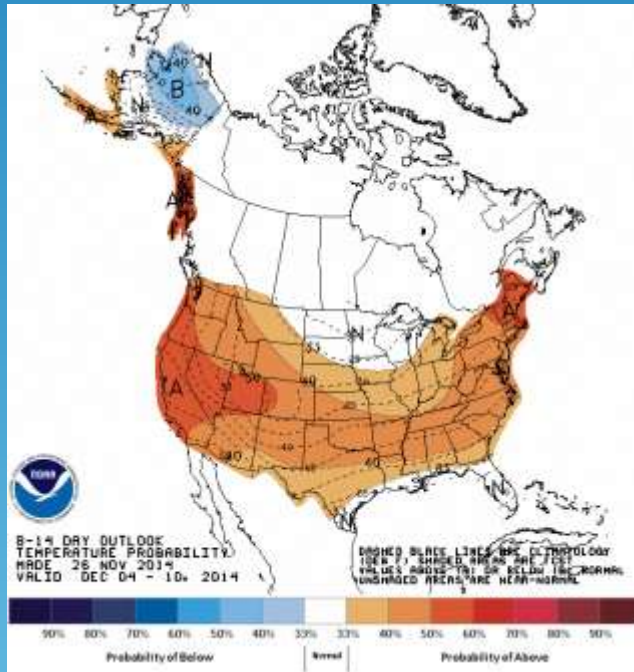
- Temperatures: Near average to below average
- Precipitation: Below average
- Snowfall: Near to possibly slightly above average, especially near Lake Michigan, otherwise near or below average snowfall.

Short Term Outlook

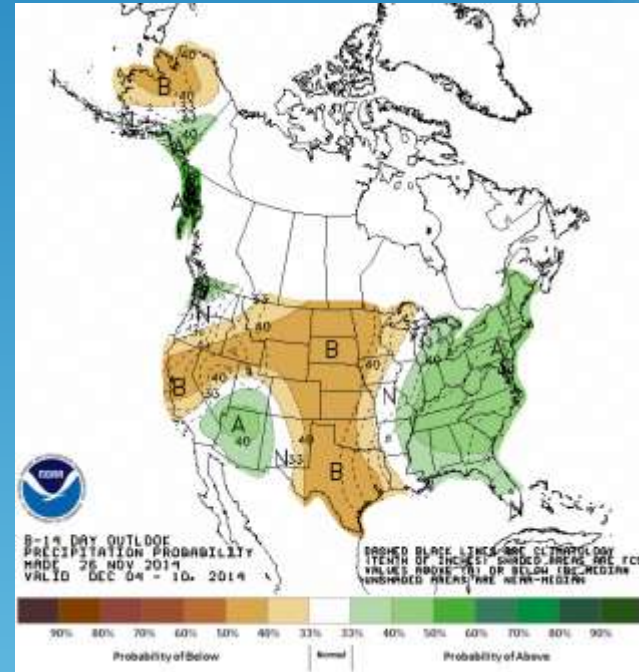
December is likely to start out milder than average

- First 1 to 2 weeks could average above normal with day to day variability expected before possible change to primarily colder conditions by mid-late month
- Could also be a fairly active period

8-14 day Temperature outlook



8-14 day Precipitation outlook



[Click here for the latest outlook](#)

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